

REMARKS

Claims 1-37 and 40-44 are pending in the application after this amendment. Claims 12, 15, 19, and 20 have been amended, claims 38 and 39 have been cancelled, and claims 41-44 have been added. The amendment, addition, and/or cancellation of claims is not to be considered in any way an indication of applicant's position on the merits of the amended, added, and/or cancelled claims. Claims 12, 15, 19, and 20 have been indicated as having allowable subject matter and have been put in independent form to put them in a condition for allowance. In the following sections of the Amendment the rejections set forth by the Examiner in the March 24, 2004, Office action are addressed. These rejections are respectfully traversed, and detailed arguments are set forth below.

The Examiner has indicated that previously pending claims 12, 15, 19, and 20 would be allowable if rewritten in independent form including the elements of the base claim and any intervening claims. Applicant has made these amendments for the purpose of furthering prosecution, but reserves the right to file continuation applications. Based on these amendments, applicant respectfully submits that claims 12, 15, 19, and 20 are now in condition for allowance.

The Examiner rejected claims 1-4, 6-11, 13, 14, 21-28, 30-33, and 35-40 as anticipated over U.S. Patent No. 6,226,050 to Lee (the "Lee reference") and claims 16-18, 29, and 34 as obvious over the Lee reference in view of U.S. Patent No. 5,774,599 to Muka et al. (the "Muka reference").

At page 3, line 13 through page 4, line 2 in the Background of applicant's application, a clear distinction is made between de-ringing and edge sharpening:

" . . . The two most prevalent coding artifacts are blockiness resulting in loss of edge sharpness, and ringing, the intermittent distortion near visual object boundaries.

Blockiness is the artifact related to the appearance of the 8x8 DCT grid caused by coarse quantization in low-detail areas. This sometimes causes pixelation of straight lines and a loss of edge sharpness.

Blockiness occurs when adjacent blocks in an image are processed separately from each other, and coding approximations assigned to each block cause a visual contrast between neighboring blocks that had visual continuity in the original image. For instance, if neighboring blocks lie in an area of the image where intensity is changing, the decoded intensity assigned to each block may not capture the original intensity gradient.

Ringings (also referred to as mosquito noise) occurs at edges on flat backgrounds where high frequencies are poorly quantized. Accordingly, ringing is usually associated with sharp image boundaries, such as text against a uniform background or computer graphics. Coarser quantization block DCT systems are typically ineffective when coding sharp visual edges, so decompressed images usually have distortion at these edges. Known de-ringing filters blur the true edges when they attempt to remove the ringing artifacts."

Also, as set forth in the Background, applicant acknowledges that both edge sharpening and de-ringing are both common post-processing methods used to remove artifacts.

The currently pending claims are specifically directed to a filtering system (or a method for filtering) for post-processing digital images and videos, having an edge mapper, a pixel sorter, and an adaptive filter that includes a de-ringing module and an edge sharpener. In preferred embodiments, the adaptive filter simultaneously performs de-ringing and edge sharpening. The combined filter is computationally simpler than known methods and can achieve removal of ringing artifacts and sharpening of true edges at the same time.

The Lee reference is directed to a signal adaptive filtering method for reducing ringing noise and signal adaptive filter. As shown in FIG. 1, the Lee device includes two filters: an average filter 140 and a weighted filter 150. If edges are present, the weighted filter is used to generate a new pixel value. If edges are not present, average filtering is performed using the average filter. Filtering is not performed if the pixel located at the center of the of the filter window represents an

edge, filtering is not performed. It should be noted, however, that both the average filter and the weighted filter are for de-ringing. There is no teaching or suggestion in the Lee reference that edge sharpening is ever performed. Although the Examiner states on page 12 of the Office action that the Lee reference teaches a method of sharpening edges using a sum of weights within a kernel, the cited section (column 5, lines 1-26) actually teaches a method by which floating point operations may be avoided by converting the floating point calculation into an integer calculation. In fact, in the Background at column 1, lines 16-32, Lee specifically distinguished ringing noises from other problems caused by block-based coding (e.g. blocking effects such as grid noise and staircase noise) and then, throughout the entire specification (including the title) specified that it reduced ringing noise. Also, there is no teaching or suggestion in the Lee reference that the filtering in the average filter and weighted filter be done simultaneously (and, in fact the pixel by pixel implementation may teach against this). In fact, in his rejection of claim 31, the Examiner specifically admits (at page 10) that the Lee reference does not disclose that the step of edge sharpening and the step of de-ringing may be performed substantially simultaneously.

Independent claims 1, 23, 31, 35, and 37 (amended), all specifically require both edge sharpening and de-ringing. As set forth above, the Lee reference fails to teach the claimed element of edge sharpening. Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration. As the Lee reference fails to disclose the claimed element of edge sharpening, applicant respectfully submits that claims 1, 23, 31, 35, and 37 are not anticipated by the Lee reference.

The claims dependent on independent claims 1, 23, 31, 35, and 37 are allowable for the same reason as discussed for their respective independent claim. Additional limitations in the dependent claims may also provide patentable subject matter and applicant reserves the right to present evidence of such patentable subject matter if necessary.

Applicant would like to emphasize that original claim 31 specifically includes the limitation that the steps of edge sharpening and de-ringing may be performed substantially simultaneously. As mentioned, in his rejection of claim 31, the Examiner specifically admits (at page 10) that the Lee reference does not disclose that the step of edge sharpening and the step of de-ringing may be performed substantially simultaneously. New claims 41-44 also include this limitation. The Examiner fails to provide any evidence that this element is taught or suggested by any of the references alone or in combination. Accordingly, applicant respectfully submits that claims 31 and 41-44 are allowable over the known prior art.

Finally, the Examiner has rejected claims 16-18, 29, and 34 under 35 USC §103 as being unpatentable over the Lee reference in view of the Muka reference. The basic requirements of a *prima facie* case of obviousness require that there must be some suggestion or motivation, either in the references themselves or in knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings (MPEP 2143). Applicant respectfully submits that there is no teaching or suggestion in either of the cited references to combine the references in any manner. Indeed, it is only through hindsight that the claimed combinations could be called "obvious." Accordingly, applicant respectfully submits that claims 16-18, 29, and 34 are allowable over the known prior art alone or in combination.

Applicant would like to advise the Examiner that he has electronically submitted an Information Disclosure Statement and five new references. Applicant respectfully requests that the references set forth on this IDS be considered and acknowledged.

Reconsideration of the claims is respectfully requested in view of the above amendments and remarks, and early notice of allowance thereof is earnestly solicited.

A Petition for Extension of Time for one month is enclosed herewith.

Application No. 09/881,384
Amendment dated June 26, 2004
Reply to Office action of March 24, 2004

Please charge Deposit Account No. 50-2115 for any additional fees which
may be required.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "Karen Oster", is written over a horizontal line.

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